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successive places of A along the line D at the several epochs, determined by the annual proper motion of 0″·252. In other words, these places are the actual positions in the heavens of the two stars at the several dates upon the assumption that the larger star has a yearly movement of 0″·252, in the direction of 92°·0. In that case B has an annual motion of 0″·18, in the direction of 195°·5. Both of the lines A and C are drawn through the positions given by the measures of 1877 and 1890, as they are made up of more individual observations, and will, I think, give a more reliable direction than could be derived from all the measures. In the inferences drawn from these measures no use is made of the approximate measures of Herschel, but we can see what the position-angle and distance should have been in 1831 by both assumptions of proper motion. At that time B must have been 24″ distant, in the direction of 65°·5, which is as close an agreement with Herschel's observation as could be expected. The minimum distance between the stars of 1″·8 will be reached about 1901, after which they will slowly separate.

The principal star is *Lalande* 593, and its place (1880) is :—

R. A. 0^{h} 21^{m} 35^{s}
Decl. — 17° 4′

The magnitude is variously estimated. In addition to the magnitude given in connection with the measures, it is rated as 8 by Lalande and Gould, and 7·3 by Schönfeld.

Mount Hamilton.
1890 *Dec.* 5.

A Comparison between the Greenwich Lunar Observations, 1887, *and Hansen's Tables uncorrected and corrected for the Change in the Unit of Mean Time introduced in the Year* 1864, *and with Hansen's Tables as modified by Professor Newcomb.* By E. J. Stone, M.A., F.R.S., Radcliffe Observer.

The Appendix to the *Monthly Notices*, vol. l., contains the results of an accurate comparison between the Greenwich Lunar Observations 1847–1861 and Hansen's Tables.

An examination of the residual errors H–O will show that the motion of the Moon was very closely represented by Hansen's Tables during the period 1847–1861. But the separate residuals indicate the existence of sensible, if small, errors in Hansen's Tables due either to defects of theory, or to imperfections in the practical methods of comparing the theoretical and observational results.

The largest residual errors H–O in longitude which I have noticed amongst the results from the meridional observations are :—

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1852, Aug. 4 and 7	+ 6″·4	+ 7″·1
1854, Sept. 28 and 29	− 13·2	− 11·5

There are several negative residuals which are not much less than 10″, and several positive residual errors about 6″. But there are more than 80 of the negative residuals which are not less than 7″, and more than 40 of the positive residuals which are not less than 4″, and, speaking broadly, the residual errors in longitude may be considered to lie between

−7″·5 and +4″·5

The Greenwich Observations 1862–1863 were directly compared with Hansen's Tables, and the results are given in the Greenwich volumes of those years. As no fundamental changes were made in the methods adopted at Greenwich in comparing the tabular and observational results between the years 1847–1863, I have given the mean annual values of H–O in longitude for the years 1847–1863, both inclusive:—

1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855
+0″·51	−0″·53	−1″·08	−0″·97	−1″·93	−1″·57	−2″·18	−2″·34	−1″·40

1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.
−1″·51	−2′·41	−2″·61	−2″·49	−3″·62	−2″·95	−2″·83	−1″·61

The mean error of Hansen's Tables for the period 1847–1863 was therefore

−1″·854

If we apply this correction to the residual errors we obtain

1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.
+2″·36	+1″·32	+0′·77	+0″·88	−0″·08	+0″·28	−0″·33	−0″·49	+0″·45

1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.
+0″·34	−0″·56	−0″·76	−0″·64	−1″·77	−1″·10	−0″·98	+0″·24

These results show that the mean annual values of H–O are subject to small but sensible errors of a periodical character, besides the constant error −1″·85. And it might reasonably have been expected that the errors of Hansen's Tables for many subsequent years would be confined within similar limits to those which existed during the period 1847–1863, and that the mean annual residual errors would oscillate about the mean value −1″·85. But, instead of such being the case, the mean annual residual errors since 1864 have, without a single exception, been positive; and although the effects of small oscillations, of about the same magnitude as those shown during the period 1847–1863, can be clearly seen, they are completely

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overshadowed by a regular secular change which has now made the mean annual residual errors of Hansen's Tables larger than the mean error from 1847 to 1863 by more than 18″.

As the Greenwich Lunar Observations have not recently been directly compared with Hansen's Tables, I have thought it desirable to compare them for the year 1887; but, for the purpose of showing the magnitude of the secular changes since the mean interval 1847–1863, and of drawing attention to the magnitude of the modifications of Hansen's Tabular Results, introduced by Professor Newcomb's corrections, and as corrected for the change of the variable, *t*, which I consider necessarily resulted from changes introduced in 1864, I have increased Hansen's residuals by the mean error 1″·85 which existed during the period 1847–1863.

This is absolutely necessary before comparing the effects of Professor Newcomb's corrections and mine. Professor Newcomb, from a direct discussion of recent observations after the change of the residual errors of Hansen's Tables had become well marked and recognised, altered the *epoch*, mean motion of the Moon relatively to the apse, and the long inequalities which enter into the fundamental argument of Hansen's Tables so that the mean residual error in longitude about 1875 became insensible; the rate of change per unit of time, agreed with the recent observations; and the earlier observations were approximately represented by an empirical modification of the long inequalities. But an alteration of *t* after 1864 to bring it back to its scale before 1864, if properly made, would simply leave the residual errors of Hansen's Tables after 1864 of the same magnitude and subject to the same periodical fluctuations as those which existed 1847–1863.

I may mention that I selected the year 1887 as the latest year available, but that I have recently received a copy of the Greenwich volume for 1888. I have examined the results sufficiently to say that, had this volume been available, a comparison between the residual errors as corrected by Professor Newcomb and those which directly result from my views of the alteration of *t* would have been slightly more favourable than the results here given. But practically the corrected results are sensibly identical, as they should be if the cause I have indicated is the real cause of the *per saltum* change in the errors of Hansen's Tables, for I, if my views are right, have altered back the new *t* to its former value; and Professor Newcomb, accepting the new *t*, alters the epoch and mean motion per unit of time to suit the variable *t*.

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The Table of Errors of Longitude and E.N.P.D.

Day, 1887.	**Errors of Longitude.** Hansen *minus* Observed.			**Errors of Ecliptic P.D.** Hansen *minus* Observed.		
	Uncorrected for the Change of *t* made in 1864, but Corrected for the Mean Error of the Tables 1847 to 1863.	Corrected by Newcomb.	Corrected for the Change of *t* made in 1864, and for the Mean Error of the Tables 1847 to 1863.	Uncorrected for the Change of *t* made in 1864.	Corrected by Newcomb.	Corrected for the Change of *t* made in 1864.
	″	″	″	″	″	″
Jan. 1	+ 9·52	−5·79	−7·32	+5·37	+4·29	+4·13
4	+15·60	−1·06	−2·31	+3·23	+2·75	+2·69
5	+12·34	−4·40	−6·18	+1·50	+1·26	+1·29
6	+14·71	−2·84	−4·36	−1·61	−1·40	−1·37
10	+17·19	−1·73	−3·67	−1·94	−0·42	−0·18
12	+19·95	+1·09	−0·92	−5·25	−3·64	−3·36
16	+21·29	+3·50	+1·66	−0·34	+0·08	+0·36
30	+16·95	+1·20	−0·11	+0·58	−0·17	−0·34
Feb. 1	+15·24	−1·25	−2·61	−1·26	−1·52	−1·56
4	+13·69	−4·12	−5·98	−1·50	−0·70	−0·58
6	+17·50	−1·41	−3·43	−1·11	+0·25	+0·54
7	+17·78	−1·54	−3·49	−2·16	−0·61	−0·25
15	+22·85	+5·60	+4·11	+2·18	+1·87	+1·80
27	+14·93	−1·16	−2·29	+0·36	−0·31	−0·41
28	+13·65	−2·49	−3·73	−1·54	−1·97	−1·96
Mar. 1	+11·76	−4·63	−6·10	−1·19	−1·35	−1·31
2	+14·12	−2·67	−4·20	+0·99	+1·20	+1·29
3	+14·78	−2·43	−4·02	−2·96	−2·28	−2·31
6	+13·79	−5·27	−7·04	−2·51	−1·01	−0·73
10	+22·10	+2·14	+0·31	−2·04	−0·74	−0·54
12	+19·46	+0·56	−1·46	−2·14	−1·58	−1·49
13	+23·16	+4·71	+2·94	+0·55	+0·68	+0·71
16	+21·30	+4·55	+3·00	−3·58	−4·27	−4·57
Apr. 2	+14·40	−3·50	−5·36	+0·18	+1·40	+1·74
3	+14·04	−4·27	−6·26	−2·11	−0·69	−0·41
4	+14·86	−4·52	−6·14	−1·98	−0·41	−0·08
7	+18·30	−1·48	−3·61	−3·47	−2·36	−2·14
8	+19·59	+0·20	−2·04	−2·34	−1·6	−1·47
10	+21·11	+2·54	+0·64	−2·11	−2·07	−2·25
11	+22·77	+4·57	+2·96	+2·87	+2·37	+2·32

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Day, 1887.	**Errors of Longitude.** Hansen *minus* Observed.			**Errors of Ecliptic P.D.** Hansen *minus* Observed.		
	Uncorrected for the Change of ι made in 1864, but corrected for the Mean Error of the Tables 1847 to 1863.	Corrected by Newcomb.	Corrected for the Change of ι made in 1864, and for the Mean Error of the Tables 1847 to 1863.	Uncorrected for the Change of ι made in 1864.	Corrected by Newcomb.	Corrected for the Change of ι made in 1864.
May 3	+14″·07	−5″·29	−7″·02	−1″·47	−0″·21	+0″·18
5	+17·94	−1·69	−3·61	−0·54	+0·22	+0·48
7	+18·97	−0·38	−2·16	−2·71	−2·68	−2·69
8	+18·89	−0·20	−1·73	−1·93	−2·19	−2·35
9	+20·08	+1·67	+0·08	−0·28	−0·80	−1·11
12	+20·79	+4·03	+2·74	+1·46	+0·36	−0·04
14	+21·15	+4·99	+3·88	+1·91	+0·46	+0·41
26	+15·62	−2·10	−3·77	−3·74	−2·77	−2·32
30	+13·97	−4·74	−6·51	−0·38	+1·01	+1·26
31	+15·34	−3·30	−5·50	−2·52	−1·56	−1·07
June 5	+18·42	−0·15	−1·94	−1·09	−1·43	−1·83
6	+20·00	+1·70	+0·15	+0·24	−0·84	−0·84
8	+19·61	+2·49	+0·90	+3·40	+2·09	+1·85
9	+20·66	+3·94	+2·44	+1·09	−0·22	−0·52
11	+20·01	+4·16	+2·67	+3·06	+1·92	+1·53
12	+17·16	+1·04	−0·09	+2·12	+0·97	+0·73
13	+20·87	+4·96	+3·67	+1·12	+0·27	−0·04
14	+17·28	+1·29	+0·05	+2·09	+1·20	+1·18
25	+19·07	+0·62	−1·29	−6·54	−5·07	−4·70
30	+16·56	−1·87	−4·07	−1·24	−0·98	−0·95
July 1	+18·88	+0·36	−1·59	−1·65	−1·60	−1·78
2	+19·95	+1·89	−0·23	−0·64	−1·03	−1·28
3	+19·63	+1·52	−0·21	−0·56	−1·16	−1·53
5	+18·23	+0·95	−0·74	−1·13	−2·39	−2·63
7	+19·58	+2·97	+1·42	+0·64	−0·71	−1·01
10	+20·59	+4·50	+3·33	+0·86	−0·20	−0·40
11	+18·10	+2·24	+0·82	+1·88	+0·89	+0·86
12	+20·84	+4·67	+3·49	+1·53	+0·88	+0·74
26	+16·22	−2·58	−4·62	−0·48	+0·02	+0·41
27	+14·42	−4·18	−6·21	−0·99	−0·72	−0·56
28	+18·88	+0·60	−1·36	−4·54	−4·60	−4·64
29	+19·25	+1·18	−0·68	−1·30	−1·61	−1·81

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Day, 1887.	**Errors of Longitude.** Hansen *minus* Observed.			**Errors of Ecliptic P.D.** Hansen *minus* Observed.		
	Uncorrected for the Change of *t* made in 1864, but corrected for the Mean Error of the Tables 1847 to 1863.	Corrected by Newcomb.	Corrected for the Change of *t* made in 1864, and for the Mean Error of the Tables 1847 to 1863.	Uncorrected for the Change of *t* made in 1864.	Corrected by Newcomb.	Corrected for the Change of *t* made in 1864.
	″	″	″	″	″	″
July 30	+20·39	+2·63	+0·75	−0·42	−1·16	−1·31
31	+21·07	+3·51	+1·83	+2·18	+1·32	+0·98
Aug. 2	+19·68	+2·41	+1·10	+0·33	−1·04	−1·27
3	+19·87	+3·21	+1·61	+1·98	+0·82	+0·29
4	+19·91	+3·28	+1·91	+1·09	−0·50	−0·59
5	+20·64	+4·29	+2·93	−0·31	−1·53	−1·87
6	+17·84	+1·58	+0·40	+2·07	+1·23	+0·72
7	+17·07	+1·42	−0·31	+3·10	+2·39	+1·96
8	+19·50	+3·78	+2·29	+1·76	+1·09	+0·89
23	+17·37	−1·45	−3·89	+1·11	+1·69	+1·70
24	+20·21	+1·23	−0·53	−1·89	−2·08	−1·83
25	+18·87	+0·46	−1·35	+1·37	+0·79	+1·01
31	+19·71	+2·97	+1·74	+0·62	−0·63	−1·02
Sept. 2	+20·94	+4·62	+3·43	+1·12	+0·16	−0·30
6	+21·29	+5·23	+3·91	+0·79	+0·39	+0·43
7	+17·27	+1·03	−0·34	+2·32	+2·27	+2·29
8	+19·09	+2·63	+1·21	−0·09	+0·20	+0·23
28	+20·21	+3·68	+2·49	+2·36	+1·03	+0·80
29	+19·16	+3·22	+1·60	+3·17	+1·54	+1·74
Oct. 1	+18·27	+2·21	+0·82	+2·61	+1·73	+1·63
2	+17·59	+1·81	+0·20	+1·19	+0·73	+0·45
10	+19·22	+1·19	−0·52	−0·54	+0·75	+1·13
22	+19·72	+1·95	+0·15	−0·74	−1·92	−2·30
24	+20·31	+3·55	+2·03	+1·00	−0·34	−0·62
25	+20·10	+3·69	+2·23	+2·66	+1·38	+1·07
28	+18·93	+2·70	+1·49	+1·84	+0·96	+0·84
30	+17·64	+1·55	+0·04	+1·46	+0·97	+0·97
31	+17·42	+1·18	−0·17	−0·82	−0·73	−0·96
Nov. 1	+19·98	+3·28	+2·22	−0·43	−0·40	−0·25
4	+17·67	+0·71	−0·69	−1·80	−0·71	−0·69
5	+15·56	−1·41	−3·08	−1·27	+0·01	+0·12
25	+17·60	+1·47	+0·09	+3·01	+2·32	+2·20

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Day, 1887.	Errors of Longitude. Hansen *minus* Observed.			Errors of Ecliptic P.D. Hansen *minus* Observed.		
	Uncorrected for the Change of *t* made in 1864, but corrected for the Mean Error of the Tables 1847 to 1863.	Corrected by Newcomb.	Corrected for the Change of *t* made in 1864, and for the Mean Error of the Tables 1847 to 1863.	Uncorrected for the Change of *t* made in 1864.	Corrected by Newcomb.	Corrected for the Change of *t* made in 1864.
	″	″	″	″	″	″
Nov. 27	+17·92	+1·73	+0·17	+0·96	+0·91	+0·75
29	+17·14	+0·54	−0·90	−0·83	−0·44	−0·29
30	+16·65	−0·10	−1·77	−0·77	−0·36	+0·09
Dec. 5	+18·94	+0·95	−0·86	−3·52	−2·17	−1·75
6	+14·99	−3·33	−5·16	−3·48	−2·06	−1·81
8	+20·49	+1·15	−0·64	−3·53	−2·63	−2·34
26	+15·63	−1·15	−2·50	−1·68	−1·45	−1·27
27	+17·31	+0·34	−1·03	−1·85	−1·19	−1·10
31	+17·95	+0·02	−1·84	−2·09	−0·58	−0·28
Sums, without regard to signs	**1866″·88**	**254″·11**	**249″·44**	**182″·24**	**134″·93**	**132″·05**
Means, without regard to signs	**18″·13**	**2″·47**	**2″·42**	**1″·77**	**1″·31**	**1″·28**
Mean Errors for the year	**+18″·13**	**+0″·71**	**−0″·91**	...	...	...

Radcliffe Observatory, Oxford:
1891 *January* 8.

Photographic Evidence of Variability in the Nucleus of the Great Nebula in Andromeda. By Isaac Roberts, F.R.S.

The photographic evidence of variability in the nucleus of the great nebula in *Andromeda* will best be appreciated if I give in chronological order the dates when the photographs were taken, and describe the appearance of the nucleus on each plate.

On August 30, 1885, a plate was exposed during 30 minutes, when the nucleus did not appear to be distinctly stellar. The Nova was then near, and was much brighter than the nucleus. The star images on the plate, including that of the Nova, are elongated because of bad clock driving, but the nucleus does not show elongation, though stars which were as faint as the nucleus are elongated.

On October 24, 1886, a plate was exposed during 73 minutes, and it shows a faint stellar nucleus, which is elongated and two centred, like all the stars on the plate.